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AXIAL MAINTENANCE DEVICE FOR A CYLINDRICAL ELEMENT AND IN PARTICULAR A CABLE

The present invention relates to a device for axial maintenance of a cylindrical element and more particularly a cable.

For fixing a cylindrical element into another element, such as for example, an electric cable into the coupling bushing of a plug or electricity socket, or furthermore, for example, into a conduit, a tube or pipe in an apparatus or accessory, it is known how to use devices which maintain said cylindrical element against traction efforts.

For this, a device for axial maintenance is known comprising an axial maintenance device for a cylindrical element and more particularly for a cable, comprising a coupling bushing which is threaded externally and which is prolonged in the axial direction by tightening nut strips, and a covering nut comprising internally a reduced pressure surface intended to act on the ends of the nut strips of the coupling bushing and to deform them radially towards

the cylindrical element previously introduced into said coupling bushing after crossing said nut.

This type of device is, for example, described in the French patent 2358766 or again in the European patent 0381980.

In the French patent cited above, the device furthermore comprises a packing seal and thus constitutes both a compression gland or stuffing box.

In this device known in prior art, the packing deforms into a truncated cone and the adhesion of the cable is active over a limited length.

Furthermore, the deformation of the packing is not well contained internally and each device can only concern a restricted number of elements to fix, in a relatively reduced range of diameters.

Finally, in such a device, there cannot be any strip anchoring in the element to be held since any traction on the latter tends to separate said strips.

Among other things, the invention makes it possible to improve the traction resistance performances of this type of device, especially in order to fulfil the anti-deflagration standards relative to the domain of electrical apparatuses.

In order to do this, a device according to the invention of the type described above is particularly notable in that it further comprises a sleeve also provided with nut strips and whose external diameter is at most equal to the internal diameter of the coupling bushing in which said sleeve is intended to be introduced beginning by said strips with which it is provided, said coupling bushing being further provided

internally with a reduced pressure surface, intended to act on the nut strips of the sleeve.

According to an embodiment, the pressure surface of the coupling bushing and the sleeve are dimensioned so that the strips of said sleeve anchor into the cylindrical element during the tightening of the nut.

In order to ensure tightness, the invention envisages an embodiment which is provided with a tubular sealing packing intended to be inserted in final position between the cylindrical element, the sleeve and the coupling bushing strips.

For example, in this case, the sealing packing is in two parts of different external diameters, the smallest external diameter corresponding substantially to the internal diameter of the sleeve and the biggest diameter corresponding substantially to the internal diameter of the coupling bushing.

A device according to the invention which remains compact and which only requires a single screwing operation also makes it possible to ensure, with a single device, both the anchoring and the sealing of various cables in a large range of diameters, which simplifies the choice of the user, limits storage problems and raises manufacturing volumes, thus reducing production costs.

The invention will be better understood and other particularities will become clear by reading the following description which refers to the attached drawings in which:

- figure 1 is an exploded view of a device according to the invention.

- figure 2 is an axial cross-section of the various elements to be assembled.

- figures 3, 4 and 5 are axial cross-sections of the device of figures 1 and 2, respectively before screwing the nut, at the beginning of screwing and at the end of screwing.

- figure 6 is a view corresponding to figure 5 according to another very slightly different embodiment.

The figures represent a device according to the invention intended to fix, in the example shown, an electric cable 1 (figures 3 to 6) in a bush 2 of an electrical connection means (coupling bushing of a plug or mobile plug or of an extension or connector etc.)

The device according to the invention comprises a coupling bushing 3 integral with the bush 2, a sleeve 4, a packing seal 5 in rubber and a ring shaped nut 6.

As shown clearly in the diagrams, the coupling bushing 3 and the sleeve 4 are provided with a base 7 and a base 8 respectively, prolonged by strips 9 and 10 respectively which protrude externally in the axial direction, the strips 10 of the sleeve 4 being positioned for assembly, as explained below, towards the strips 9 of the coupling bushing 3 (figures 1 and 2). The base 7 of the coupling bushing 3 is further provided with an external threading as shown in the drawings, intended to co-operate with the internal threading of the nut 6.

At the base of its threading the nut 6 has an internal pressure surface 11 reduced for example in truncated form whose function will be explained below.

In the same way, the base of the coupling bushing 3 is, on the opposite side from the strips 9, provided with a reduced internal pressure surface 12.

As shown clearly in the drawings, the packing 5 has two parts 5a and 5b in steps of different external diameters.

The smallest external diameter (part 5a) of the packing 5 corresponds substantially to the internal diameter of the base 8 of the coupling bushing 3 and the biggest diameter (part 5b) corresponds substantially to the internal diameter of the strips 9 of the sleeve 4 before deformation, while the external diameter of said sleeve 4 is substantially equal to the internal diameter of the coupling bushing 3.

The drawings show clearly the way in which to assemble together the various elements of the device.

The elements are initially arranged as shown in figures 1 and 2.

Beginning from this assembly, the sleeve 4 is introduced by its strips into the coupling bushing 3, and after or before, the part 5a is introduced into the packing 5 in the base 8 of the sleeve 4 and the covering nut 6 is set in place on the strips 9 of the coupling bushing 3 in order to be in the position of figure 3.

Before or after this first assembly, the cable 1 is evidently introduced through all the elements (2, 3, 4, 5 and 6).

Starting from the position of figure 3, the nut 6 is pushed which itself pushes the packing assembly 5 and sleeve 4 until the strips 10 of the sleeve 4 are held radially by the pressure surface 12 of the coupling bushing 3 to be deformed and to be tightened onto the cable 1 as shown in figure 4.

Next the screwing of the nut 6 is carried out which accentuates the deformation of the strips 10. By continuing said screwing of the nut 6, the strips 9 of the coupling bushing 3 tighten radially on the packing 5 by deforming under the effect of the pressure surface 11 of said nut 6.

In the embodiment of figures 1 to 5, the length of the sleeve 4 and the pressure surface 12 of the coupling bushing 3 are such that the strips 10 of said sleeve 4 are anchored at the end of screwing in the cable 1 as shown in figure 5.

In the embodiment of figure 6, the base 8 of the sleeve 4 is less long axially and/or the strips 10 are shorter as well as the pressure surface 12, in such a way that in this embodiment, said strips 10 do not anchor in the cable 1. Given that the differences of the sleeve and the surface 12 of the coupling bushing 3 of the device of figure 6, relative to the sleeve 4 and the coupling bushing 3 of figures 1 to 5 are essentially dimensional, the same references have been kept on said figures.

On figures 5 and 6, it can be seen that the packing 5 is perfectly compressed by the sleeve 4 and the strips 9 of the coupling bushing 3, and furthermore it is perfectly maintained between its two ends by the

strips 9 and 10 of the coupling bushing 3 and the sleeve 4 respectively.

Compared to prior art, the invention enables a greater length of contact between the packing 5 and the cable 1 together with a greater volume of deformed packing, which increases the reliability of the sealing and retention, thus ensuring a greater reserve of elasticity to compensate for the relaxation of plastic parts intended to compress the packing.

The strips of the coupling bushing 3 act on the packing 5 and the cable 1 in a classic way whereas the strips 9 of the sleeve 4 act in the opposite direction with, further, an anchoring or not, in the cable 1 (figures 5 and 6 respectively).

Furthermore it can be understood that in the embodiment of figures 1 to 5, any traction on the cable accentuates the anchoring of the sleeve 4, said anchoring thus being self-blocking.

If the embodiment relates in particular to an electric cable, it can evidently concern, as explained above, any cylindrical element.